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Possible Metrics to Determine the Impact of the SEARCH Program on Brevard County Schools

by
Kevin M. Berry

Abstract

The paper reports on attempts to measure the effects of a mentoring program called Science, Engineering and Research Help (SEARCH). The paper analyzes the process, reviews the current metrics, and suggests future possible measures.

Introduction

The Lockheed Space Operations Company (LSOC), under the sponsorship of NASA at the Kennedy Space Center, has established a mentoring program with a local middle school. The program, now in the fourth year, is felt by all participants to be of value to the students involved. Limited attempts at measuring this value have been made. This paper will:

- Overview the SEARCH program
- Define what is being measured
- Design the ideal measures
- Compare the existing measures against the ideal
- Suggest future metrics

This paper was prepared to satisfy the curiosity of the author. While information was obtained through LSOC management and employees, all conclusions and opinions are solely those of the author.

SEARCH Program Overview

The LSOC Science, Engineering, and Research Help (SEARCH) program was formed in response to a NASA management request for participation in the NASA SEARCH program. The stated purpose of the program is to encourage, assist, and motivate students to pursue careers in technical fields. The program emphasizes assistance to female and minority students. A typical target student would have recognized potential but lack motivation to pursue technical education.

The program was started in August, 1991 to support the 1991-92 school year. The Clearlake Middle School in Cocoa, Florida, was chosen to be supported. The level of involvement is shown in Table 1.

Possible Metrics to Determine the Impact of the SEARCH Program on Brevard County Schools

School Year	Students Mentored	Estimated Hours Expended*
1991 - 92	35	3,000
1992 - 93	75	6,000
1993 - 94	78	6,000
1994 - 95 ^b	64	5,000
Total ^c	64	20,000

Table 1 - LSOC Involvement in Clearlake Middle School²

- Notes:
- * Estimated Hours Expended - includes travel, activities, Steering Committee, meetings
 - ^b 1994-95 A decision was made to limit students to 64, due to bus limitations. Otherwise, growth would have continued.
 - ^c Total includes students who were mentored two years

Defining the Measurements

Before defining the measurement, the process must be described. The SEARCH activities fall more into the category of customer service than production, according to prevailing Total Quality Management (TQM) theory.³ For this paper, the process definition will be "mentoring." Mentoring may be defined as "advising or counselling."⁴ Another, simpler definition is "a process involving people."⁵ The purpose of a mentor is to "provide positive friendship and admiration."⁶ The overall program goal to be measured against is:

"To encourage, assist, and motivate students to pursue careers in technical fields"

The following section will determine possible measurements using standard TQM analysis techniques. Table 2 presents the process relationships.

Suppliers	Input	Process	Output	Customers
LSOC	Budget	Mentoring	Motivated Students	Students
Employees	Mentors			School Industry

Table 2 - Process Relationships⁷

Each Input and Output in Table 2 has been parsed against possible measurements in Table 3. Previous and current measures are highlighted.

The ultimate measurement would be process efficiency, the ratio of output value to input cost. In this case, there would be two ratios. Summarizing the overall process goal as a "turnaround," then process efficiency would be:

$$\frac{\text{Number of turnarounds}}{\text{\$ spent}} \quad \text{and} \quad \frac{\text{Number of turnarounds}}{\text{Hours spent}}$$

Possible Metrics to Determine the Impact of the SEARCH Program on Brevard County Schools

Item	Quantity Measure	Quality Measure
Budget	\$ spent**	N/A
Mentors	Hours spent**	Experience level Student perception*
Motivated Students	Number completing first year**	Mentor perception*
	Number desiring to continue into second year	Student perception*
	Number pursuing higher education who wouldn't have	Teacher perception
	Improvement in grades*	Employer perception

Table 3 - Potential, Previous* and Current Measurements**

Analysis of Existing Measurements

Quantitative

Budget

The budget is divided into two parts: Labor and Non-labor. Both are being tracked and used to predict future expenses. In fact, prior to the 1994-95 school year, budget data was used to aid in a decision that halved the cost of the program to LSOC. Previously, mentors were able to charge two hours per week to SEARCH. For 1994-95, they were asked to split the time with the company, reducing the cost by 50%. Non-labor costs are also being tracked and predicted.

Hours Spent

The hours spent by the mentors are available through a log kept at the school. This information is being used to monitor the program. A decline in mentor attendance was recently noticed through this measurement and determined to be a "one time" event, not a serious trend.

Number of Students Completing the Program

This measure is easily obtainable, and provides an indication of student satisfaction with the program. It cannot be assumed, however, that a high retention rate means that program goals are being met. The mentors are attempting to motivate the students to change their study habits. As indicated by survey data, some target students merely see the program as an easy "out" from classroom work. By going along with student desires and making the mentoring hour pure "fun," a 100% retention rate could be achieved, at the expense of the overall goal.

Possible Metrics to Determine the Impact of the SEARCH Program on Brevard County Schools

A contrary opinion is that building a relationship, even if based on "fun," is in the long term interests of the student and program, and attitude changes may not be manifested until the second year, or later in life. As with all process measurements, this data must be analyzed in conjunction with all other available information to arrive at a valid conclusion.

Qualitative

Mentor Perception

The mentor's perception of student progress was monitored through a survey instrument. Each mentor was requested to fill out a survey quarterly. This was done for 8 quarters.

The results must be seen, at best, as an indicator of progress rather than scientific data. Since only 53% of possible surveys were returned, the data fails the test for statistical significance. Also, a comparison of the survey data between the 1992-93 and 1993-94 school years shows a disparity in the overall averages. This could be due to changes in student or mentor selection criteria, climate of the school, or simply the first point in a repeatable pattern. Due to the lack of definitive results, this measure has been discontinued for the 1994 school year.

A high level look at the results do show a slight improvement trend in the areas of fun, social skills, and learning skills. These areas seem closely linked to the definition of mentoring listed previously, indicating some success in building relationships.

Student Perceptions

The student perceptions of the program have also been surveyed. The survey was limited to students who returned to the program for a second year. Again, this survey information must be taken as an indicator, rather than statistically significant data. By limiting the survey to students returning for a second year, some bias probably was introduced.

Grades

The student's grades have been made available to the mentors. No clear pattern has emerged. It is felt that, while an improvement in grades is certainly desirable, too many external factors contribute to good (or poor) grades for this measurement to be statistically valid. Also, while good grades do contribute to the overall program goal, they are not directly linked.

Possible Additional Metrics

Number of Students Desiring to Return the Second Year

This number is available from program records. Unfortunately, only seventh grade students would be applicable, since eighth graders move out of the program. Still, the desire of seventh graders to remain in the program would be an indicator of student happiness. The downfalls listed under "Students Completing the Program" are applicable here, also.

Possible Metrics to Determine the Impact of the SEARCH Program on Brevard County Schools

Teacher/Counselor Perception

Since teachers and counselors provided the evaluation that placed the student in the program, they are uniquely situated to evaluate students progress. On a case by case basis, school officials may see a turnaround. In general, it is felt that the overall program goal may not be visible to teachers, especially since the students move on to another school after one or two years in the program.

Number of Students Pursuing Higher Education

Since this is the ultimate goal of the SEARCH Program, efforts could be made to follow students through the twelfth grade. The first participants are now in the tenth and eleventh grades. Surveying them to ascertain their intentions could provide valuable insights. To perform a true assessment, a control group of similar students who did not participate in a mentoring program would also need to be surveyed. Obviously, the best measure will be to wait two more years, then survey the graduates to see if they actually enter college.

If this number was available, the process efficiency could be calculated. The program cost is known, so the simple formulas shown previously could be used. Then, training and relocation costs could be compared to demonstrate the value to Brevard county employers of a college educated, locally situated pool of workers. Some rough calculations show that a successful turnaround of only 20 of the target students would pay back the entire program cost to date.

Also, intangibles such as community goodwill, improved morale of the mentors through participation, and favorable publicity must be considered.

Employers Perception of New Employees

This is the ultimate test of the SEARCH Program. Unfortunately, a follow-up of this magnitude is probably beyond the capabilities of LSOC.

Conclusions/Results

Industry support of local schools to reconstruct America's pool of educated, skilled technical graduates is on the rise.⁸ LSOC also remains committed to supporting local schools. Unless there is a significant shift in philosophy by the company management, the SEARCH program will continue, whether or not accurate metrics are developed. To provide feedback and guidance to the program, as well as to help justify the cost, an attempt should be made to determine the overall effectivity of the program.

End Notes

¹ LSOC SEARCH Program (Descriptive Handbook), November 12, 1991

² LSOC Science, Engineering, and Research Career Help (Presentation Package), July 21, 1994

³ Oakland, John S. "Total Quality Management," Butterworth-Heinemann, Oxford, GB p. 227

⁴ The American College Dictionary, Random House, NY 1962

⁵ Hendricks, Howard; "A Mandate for Mentoring," Seven Promises of a Promise Keeper, Focus on the Family, Colorado Springs, CO p. 51

⁶ Joy, Donald; Men Under Construction; Victor Books, Wheaton, IL 1993

⁷ "Guidelines and Tools for Continuous Improvement." Calabasas, CA: Lockheed.

⁸ "Education, Challenge in the Classroom," Aviation Week and Space Technology, McGraw-Hill, November 14, 1994